
जूट के भू वस्त्र

भाग 2 नदियों तथा पानी के जलाशयो के किनारों को काटने से
रोकना — विशिष्टि
(दूसरा पुनरीक्षण)

Jute Geotextiles

Part 2 Control of Bank Erosion in Rivers and
Waterways — Specification

(*Second Revision*)

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FOREWORD

This Indian Standard (Part 2) (Second Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Geosynthetics Sectional Committee had been approved by the Textile Division Council.

This standard was first published in the 2000 and subsequently revised in 2013. This standard has been again revised to incorporate the following major changes:

- a) Requirements for weave, ends/dm, picks/dm, mass, thickness, tensile strength, bursting strength, permittivity and apparent opening size have been modified.
- b) Method of test for puncture resistance has been modified.
- c) Requirement for tear strength has been excluded.

This standard has been published in two parts. The other part in this series is:

Part 1 Strengthening of sub-grade in roads — Specification

The main causes of bank erosion are:

- a) Weak bank soil which is easily erodible;
- b) Strong current and eddies near the bank;
- c) Waves induced by wind and moving vessels;
- d) Large fluctuation of water level; and
- e) Uplift pressures due to alternating hydraulic gradients.

Bank erosion may be controlled effectively either by repulsion of flow away from the affected banks say, by construction of spurs or by providing a durable protection to the affected banks or by a combination of both these measures.

Repulsion of flow can be effected by construction of suitable flow regulatory measures at appropriate locations. Protection of the banks is done by laying the appropriate woven jute geotextiles (JGT) on the affected bank duly prepared to a stable and undulation-free gradient (within the angle of internal friction of the bank soil) overlain by a layer of granular armour/riprap of adequate weight. Where feasible, suitable vegetation with a deep root system (as in *vetivar grass*) may be planted.

The approach to control bank erosion is to ensure ‘sand tightness’ and the desired permittivity to prevent differential over pressure developing across the fabric. At the same time, it requires to be ensured that JGT shall possess sufficient strength to withstand installation stresses (survivability of JGT) and retain the design strength up to at least 4 years for tidal rivers with two-way flows and 2 years for one-way flow.

Use of woven JGT in controlling river bank erosion is recommended as an eco-friendly substitute of the conventional granular filter comprising graded boulders and ballasts of stone, laterite or similar materials of the desired specific gravity. JGT, while ensuring ‘sand tightness’ under different types of extraneous hydraulic and mechanical loads, facilitates dissipation of the over pressure created as a result of ingress of water into the bank soil due to rise of water level usually during the high tides in a tidal river and during the rains in unidirectional rivers. This is essentially a function of filtration. Lateral dispersion of water is also facilitated by JGT (drainage). Erosion of bank soil is controlled as migration of the bank soil is substantively prevented and the entrained water within it is effectively released.

JGT laid over the prepared bank soil requires to be ballasted by a layer of armour stones to prevent its direct exposure to weather. It is strongly advised that seeds of local deep-rooted vegetation/grass shall be spread after laying of the fabric. On degradation of JGT vegetation will take over, cling to the bank soil, dissipate energy of current and waves to a good extent. This is a bio-engineering approach that is being increasingly favoured in developed countries. JGT on its degradation will nourish the bank soil and improve its hydraulic conductivity, fostering quick growth of vegetation under normal situation.

Indian Standard

JUTE GEOTEXTILES

PART 2 CONTROL OF BANK EROSION IN RIVERS AND WATERWAYS — SPECIFICATION

(*Second Revision*)

1 SCOPE

This standard (Part 2) provides requirements of woven jute geotextile (JGT) in control of erosion in rivers and waterways.

2 REFERENCES

The standards listed in Annex A contain provisions which, through reference in this text constitute provision of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated in Annex A.

3 TERMINOLOGY

For the purpose of this standard, the definitions as given in IS 14715 (Part 1) and the following shall apply.

3.1 Retention of Fines or Soil Tightness — A part of filtration function, implying restriction of top soil migration without filtration functions of the fabric.

4 REQUIREMENTS

Usually, woven JGT possessing tensile strength of 20 kN/m (considering hydraulic load and installation stresses) shall serve the purpose. The fabric needs to be smeared with a suitable natural additive, to add to its desired durability against its constant contact with water. The treated woven JGT shall meet the requirements specified in Table 1. Porometry shall be decided on the basis of grain size distribution of the bank soil. However, following is recommended for guidance.

Soils can be divided into three zones on the basis of their particle size distribution (*see* Fig. 1).

- a) *Zone 1 Soils* — These soils consist of more than 85 percent clay and silt (particles smaller than 0.075 mm) and often have sufficient cohesion ($PI > 15$) and low permeability. Retention requirements for mechanical filter stability of JGT used in zone 1 soils for dynamic flow conditions has been derived from Franzius Institute as follows:

$$O_{95 (JGT)} \leq 10 \times d_{50}$$

- b) *Zone 2 Soils* — Zone 2 soils consist of coarse silts and fine sands. Zone 2 soils are considered to be problem as they exhibit an increased tendency for the movement of fine soil particles (scouring, erosion and silting up). The retention requirements for the mechanical filter stability of JGT used with zone 2 soils for dynamic flow conditions has been derived from Franzius Institute as follows:

$$O_{95 (JGT)} \leq d_{90}$$

- c) *Zone 3 Soils* — Zone 3 soils consist of medium sands to coarse size grain particles. To ensure that high mechanical and hydraulic filter efficiency is maintained, JGT filter must be used, which meets the retention requirements which has been derived from Kaytech design guidelines as follows:

$$O_{95 (JGT)} < d_{50}$$

5 SAMPLING

Sampling shall be done in accordance with IS 14706.

6 PACKING

Packing shall be done as per IS 4744. Prolonged storage of packed material or its exposure to the open shall be avoided.

7 MARKING

7.1 Unless otherwise agreed to between the buyer and the seller, the roll shall be stenciled with an indelible ink of any suitable colour with the following:

- a) Name of manufacture;
- b) Length and width in metres;
- c) Type of jute geotextile
- d) Roll number;
- e) Any other information as required by the law in force.

7.2 BIS Certification Marking

The jute geotextile may also be marked with the Standard Mark.

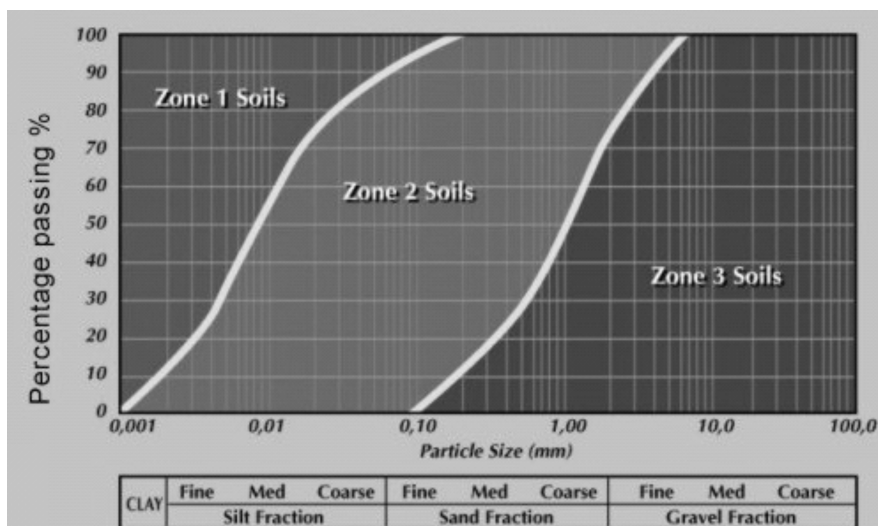


FIG. 1 SOIL ZONES FOR DETERMINATION OF GEOTEXTILE FILTER REQUIREMENTS

Table 1 Requirements for Treated Woven Jute Geotextiles

(Clause 4)

Sl No.	Characteristic	Requirement	Tolerance Percent	Method of Test, Ref to
(1)	(2)	(3)	(4)	(5)
i)	Construction	1/1 DW plain weave	—	Visual
ii)	Weight at 20 percent moisture regain, g/m^2 , <i>Min</i> ¹⁾	627	—	IS 14716
iii)	Width, cm ²⁾	As agreed	± 1	IS 1954
iv)	Ends $\times$ Picks / dm, <i>Min</i>	85×32	—	IS 1963
v)	Thickness at 2 kPa, mm	1.70	± 10	IS 13162 (Part 3)
vi)	Tensile strength in MD $\times$ CD, kN/m , <i>Min</i>	20×20	—	IS 13162 (Part 5)
vii)	Elongation at break in MD $\times$ CD, <i>percent</i>	8×8	± 10	IS 13162 (Part 5)
viii)	Puncture resistance, kN , <i>Min</i>	0.400	—	IS 13162 (Part 4)
ix)	Burst strength, kPa , <i>Min</i>	3 100	—	IS 1966 (Part 1) or IS 1966 (Part 2)
x)	Permittivity at 50 mm constant head, sec^{-1} , <i>Min</i>	350×10^{-3}	—	IS 14324
xi)	Apparent opening size (A. O. S.), O_{95} , <i>Micron</i> ³⁾	150-400	—	IS 14294

¹⁾ For river bank protection purpose, the 627 gsm fabric to be treated with suitable additives.

²⁾ Width of the fabric shall not be less than 100 cm.

³⁾ A. O. S. (O_{95}) is decided on the basis of average particle size distribution of soil and its hydraulic conductivity.

7.2.1 The use of the Standard Mark is governed by the provisions of *Bureau of Indian Standards Act, 1986* and the Rules and Regulations made thereunder. The details of conditions under which the licence for the

use of the Standard Mark may be granted to manufacturers or producers and same may be obtained from the Bureau of Indian standards.

ANNEX A

(Clause 2)

LIST OF REFERRED INDIAN STANDARDS

<i>IS No.</i>	<i>Title</i>	<i>IS No.</i>	<i>Title</i>
1954 : 1990	Determination of length and width of woven fabrics — Methods (<i>second revision</i>)	(Part 4) : 1992	Determination of puncture resistance by falling cone method
1963 : 1981	Methods for determination of threads per unit length in woven fabrics (<i>second revision</i>)	(Part 5) : 1992	Determination of tensile properties using a wide width strip
1966	Textiles — Bursting properties of fabrics — Determination of bursting strength and bursting distension	14294 : 1995	Geotextiles — Method for determination of apparent opening size by dry sieving technique
(Part 1) : 2009	Hydraulic method (<i>second revision</i>)	14324 : 1995	Geotextiles — Methods of test for determination of water permeability — Permittivity
(Part 2) : 2009	Pneumatic method (<i>second revision</i>)	14706 : 1999	Geotextiles — Sampling and preparation of test specimens
4744 : 1991	Textiles — Packaging of jute products in rolls — Specification (<i>first revision</i>)	14715 (Part 1) : 2016	Jute geotextiles : Strengthening of sub-grade in roads — Specification (<i>second revision</i>)
13162	Geotextiles — Methods of test	14716 : 1999/ ISO 9864 : 1990	Geotextiles — Determination of mass per unit area
(Part 3) : 1992	Determination of thickness at specified pressures		

ANNEX B

(Foreword)

INSTALLATION METHOD

B-1 The bank shall first be cut to a stable slope preferably at the angle of internal friction of the bank soil. The surface shall be leveled and made free from angular projections, undulation, soil-slurry or mud.

B-2 Anchoring trench (usually rectangular) shall be excavated at the top of the slope. Recommended dimensions of the trench is 500 mm deep and at least 250 mm wide at the bottom. The trench shall be free from foreign materials, mud, etc.

B-3 JGT shall then be unrolled across the trench and along with slope from top to down side to the lowest water-level.

B-4 JGT shall be stapled with U-shaped nails (usually 11 gauge) within the anchoring trench both at the sides and bottom at an interval of 300 mm along the length of the trench. There shall be at least 2 staples both depth-wise and width-wise in each cross-section.

B-5 JGT shall be laid with the overlapping in the direction of water-flow. Care shall always be taken to ensure that JGT does not suffer damage due to puncture,

tear and installation stresses.

B-6 The recommended overlap is 150 mm (minimum). The overlapped portion shall be stapled at an interval of 300 mm.

B-7 The anchoring trench shall then be filled with stones/boulders for securing and protecting the JGT. Care shall be taken to ensure that JGT touches the bank slope at all points (proper drapability of JGT).

B-8 Armour overlay of stone/boulder shall then be placed on the JGT carefully. It shall be ensured that armour stones/boulders are not dropped on the JGT, but are carefully placed and properly arranged. A thin layer of sand (25 mm) as a cushion on top of the JGT is recommended to avoid puncture of the fabric by granular armour. Similar care in laying shall be taken when a combination of granular filter and JGT is used under reversing flow-condition. There must be a beam at the toe of slope. This can be done by folding the JGT as per dimensions (usually 500 mm diameter) with sand fill and duly stapled on the other side preferably at an interval of 75 mm. Alternatively, an angular trench

IS 14715 (Part 2) : 2016

may be dug at the toe and the JGT placed on it ensuring full contact with the soil, duly stapled at a spacing of 75 mm and ballasted. Care shall be taken to see that the overlapping layer is not displaced during installation. Suitable grass-seeds shall then be spread on the treated bank. Alternatively, saplings of suitable plants that thrive in similar geotechnical and hydraulic

conditions may be planted at close intervals through the interstices of the overlay, taking care to place them into the bank soil.

NOTE — The weight and specific gravity of each boulder shall be at least 25 kg-30 kg with specific gravity of 2.8.

B-9 A typical cross-section of river bank protection with jute geotextile is given in Fig. 2.

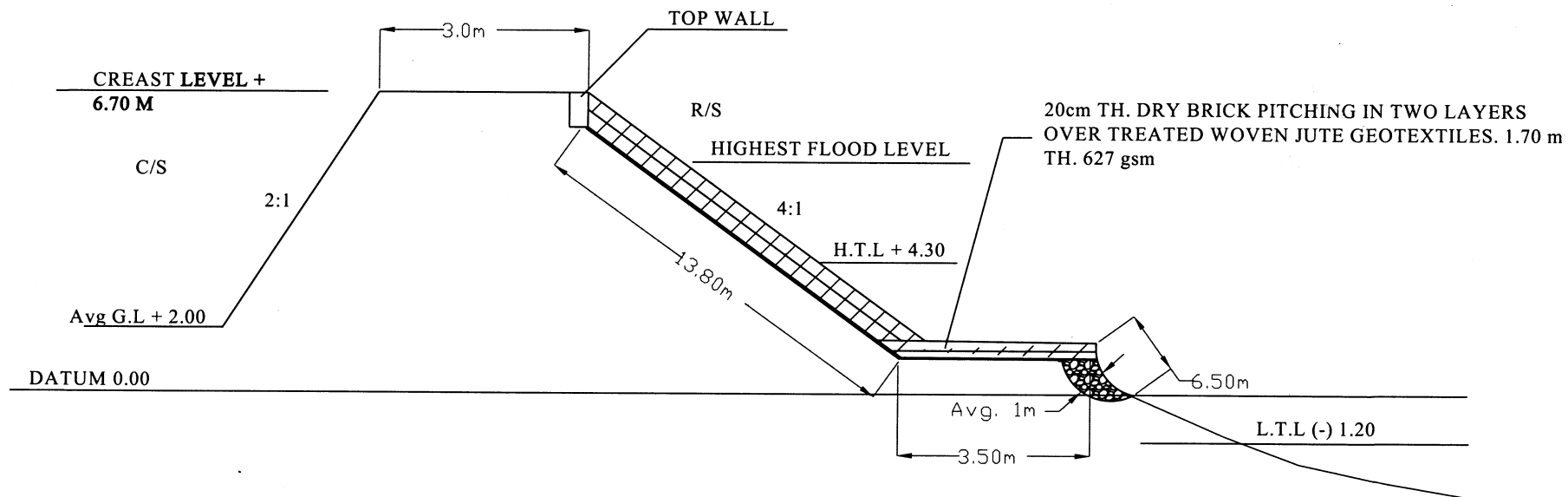


FIG. 2 TYPICAL CROSS-SECTION OF RIVER BANK PROTECTION WORK WITH JUTE GEOTEXTILE (JGT)

ANNEX C

(Foreword)

COMMITTEE COMPOSITION

Geosynthetics Sectional Committee, TXD 30

<i>Organization</i>	<i>Representative(s)</i>
The Bombay Textile Research Association, Mumbai	DR A. N. DESAI (Chairman) SHRI V. K. PATIL (<i>Alternate</i>)
Ahmedabad Textile Industry's Research Association, Ahmedabad	DR ANIL KUMAR SHARMA SHRIMATI SEEMA PATEL (<i>Alternate</i>)
Brahmaputra Board, Guwahati	SHRI CHAMAN LAL SHRI DHRUBAJYOTI BORGOHAIN (<i>Alternate</i>)
Business Coordination House, New Delhi	SHRI SAMIR GUPTA SHRIMATI RITIKA GUPTA (<i>Alternate</i>)
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Central Road Research Institute, New Delhi	SHRI SUDHIR MATHUR SHRI JAI BAHAGWAN (<i>Alternate</i>)
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Department of Jute and Fibre Technology, Kolkatta	DR SWAPAN GHOSH PROF (DR) A. K. SAMANTHA (<i>Alternate</i>)
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<i>Member Secretary</i>	
SHRI J. K. GUPTA Scientist 'C' (TXD), BIS	

(Continued from second cover)

For control of erosion in rivers and waterways, woven JGT treated with eco-friendly water-repellant additives is recommended. Such additives have already been developed in IIT, Kharagpur and Indian Jute Industries' Research Association (IJIRA), Kolkata.

Method of installation of jute geo-textiles is given in Annex B for information only.

The composition of the Committee responsible for the formulation of this standard is given in Annex C.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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